Space Weather Forecast

Issued on Wednesday, 21 June 2023 at 01:05 Local

This forecast provides a four day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor/Moderate R1/R2 Radio Blackouts Likely throughout. Slight chance of Minor Geomagnetic Storm G1 Days 2 & 3.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Solar activity has been high over the past 24 hours, with an impulsive X-class flare observed at 20/1709UTC and originating from a relatively benign solar region in the southeast quadrant. The number of sunspot regions has now reached double figures. Some of the regions also display rather large north-south extents, and may yet be partitioned into separate groups. The largest and most complex region is now situated in the southwest but remains largely inactive. Two regions are particularly active, the first one has recently emerged in the south-east whereas the other one has developed rapidly in the last 24 hours. There are also two other regions that are showing signs of rapid growth, both possible markers for heightened activity.

There are numerous 'filaments' (arcs of plasma) on the Sun at present. Perhaps the most obvious event in the period was a large 'prominence' (arc of plasma on the Sun's edge) lift-off from the north-western horizon around 20/0500UTC. This is clear in some subsequent satellite imagery and will be analysed in due course, although provisionally it is perhaps a little far above and ahead of the track of the Earth in its orbit for any effect to be felt here.

In addition to this, a rapidly emerging filament was then seen in near infrared imagery in the western solar hemisphere between 20/0400-0500UTC, although this did not culminate in any lift-off at the time of writing. Also of note was movement in filaments near the solar meridian in the southern solar hemisphere through the current UTC morning, although there is again no evidence of any resulting CME in satellite imagery.

At present then, there are no new confirmed Earth-directed CMEs.

Solar Wind / Geomagnetic Activity: The solar wind showed probable ongoing connection to a 'coronal hole' fast wind. Some upstream satellite data on the Sun-Earth line recently showed some slight discontinuities in its speed trace, one of which occurred at 20/1900UTC - but this was not well reproduced in other satellites, and while these may be instrument errors, they are perhaps more likely to be variation within negative polarity coronal holes.

The solar wind speed was relatively steady and confined to slightly elevated levels, between 410-460km/s. The number of particles in the solar wind was within its typical background range throughout, while its magnetic field was also at background. The north-south component showed a small-scale erratic behaviour, with no protracted periods spent anti-aligned with Earth's field (to greater effect).

The net effect of the above solar wind measures was for mostly quiet geomagnetic activity.

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Energetic Particles / Solar Radiation: No solar radiation storms were observed.

Four-Day Space Weather Forecast Summary

Solar Activity: Solar activity is expected to remain Moderate, with isolated or occasional M-class flares and a slight chance of X-class flares.

Solar Wind / Geomagnetic Activity: The geomagnetic forecast carries lower-than-average confidence. While mostly Quiet to Unsettled conditions are expected overall, there is a chance of an Active or even a slight chance of a G1/Minor Storm interval on Days 2 & 3 (22nd & 23rd), under the combined influence of an expected fast wind and also perhaps additive glancing from some minor peripheral CMEs.

Energetic Particles / Solar Radiation: No solar radiation storms are expected, with a daily slight chance of S1 or greater.

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Met Office Space Weather Forecast

Geomagnetic Storms:

Geo-Magnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	No	5	10	10	5
Strong	G3	No	1	1	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X Ray Flares:

X Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 M Class	Yes	60	60	55	50
Very Active	R3 to R5 X	No	5	5	5	5

Solar Radiation Storms - (High Energy Protons):

Radiation Storms Probability (Exceedance)	Level (cm^{-2} sr^{-1} s^{-1})	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	≥ S1	No	10	15	20	20
Very Active	≥ S3 *	No	1	1	1	1

* S3 ≥ 10 MeV ≥ 1000 pfu and / or ≥ 50 MeV ≥ 10 pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)

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